clearly empty of food at this time. Following this, the floor of the then closed mouth bulged out with regurgitated food which was promptly fed to a half-grown nestling. In rapid succession, over the next 2–3 minutes 10 more similar sized regurgitations were fed to the chick. In each case, prior to feeding the chick, the floor of the mouth appeared distended, approximately to the same extent as in swifts carrying a single food bolus, and empty afterwards. In total, the chick appeared to receive, in one bout of provisioning, the equivalent mass of food as many individual boluses delivered throughout the day. Multiple feedings over a period of eight minutes has also been observed in British Colombia (Grant 1966). On 8 August 1987, at a nesting site at Lawler Falls in southern California (Foerster & Collins 1990, Collins & Foerster 1995) an adult Black Swift was photographed feeding its chick at dusk shortly after returning to the nest for the night. What appeared to be the same adult again fed the chick over an hour later, well after dark (Collins & Peterson 1998). Thus multiple feedings over a longer period of time are also confirmed. Elsewhere, Black Swifts collected after dark, at a nest, had large quantities of food in their oesophagus (Collins & Landy 1968). This also suggests that the chick would be provisioned one or more times during the night.

Hespendeide (1975) was perhaps the first to suggest that some swifts might be specialists on a limited array of species, particularly calorically-dense swarming insects. However, he suggested that this was limited to a few of the very large species, as those in *Streptoprocne*. Whitacre (1992) verified that swarm feeding was typical of both White-collared and White-naped Swifts but related it mostly to patchily distributed food resources in seasonally dry climates and the development of coloniality. I think there is now enough information on swarm feeding by all species of the Cypseloidinae studied to date to suggest a stronger phylogenetic component to this behavioural specialization, and its morphological correlate, of carrying larger quantities of food in the expanded oesophagus and provisioning chicks at longer intervals. Swarm feeding, however, may not be limited to the Cypseloidinae but also appears in several species of swiftlets (*Aerodramus*) (Harrison 1976, Collins & Francis, unpublished). Studies of the foraging range and feeding rate in these species are clearly called for.

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The taxonomic status of *Halcyon enigma* on the Talaud islands, Indonesia

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The kingfisher *Halcyon enigma* Hartert, 1904 is endemic to the Talaud islands, a small archipelago located between Sulawesi and the Philippines. The unresolved taxonomic position of *Halcyon* kingfishers on these islands partly reflects a lack of recent fieldwork, but new information gathered by the authors in September and October 1995 and January to March 1997, suggests that *enigma* should be regarded as a species, and not a subspecies of *Halcyon chloris*.

On the three largest islands in the Talaud group, Karakelang, Salibabu and Kabaruan, kingfishers resembling Collared Kingfisher *H. chloris* have been collected, specimens of which can be fitted into two exclusive size ranges. The small specimens were initially thought to be forms of Sacred Kingfisher *Halcyon sancta* (Meyer & Wiglesworth 1895) or immature *H. chloris* (Meyer & Wiglesworth 1898).

These conclusions were shown to be erroneous, and the small form was first described as a separate species, *Halcyon enigma*, by Hartert (1904). His conclusions were based on eight specimens with bills 35–40 mm long against 45–50 mm in *chloris* specimens from the Talaud group, and wings 94–98 mm as opposed to 108–120 mm in *chloris*. Hartert noted "Whether this small form on Talaut is a geographical representative of *chloris* (though both are found on Talaut, one might only breed there, the other be an occasional immigrant), or a perfectly developed species coexisting with typical large *chloris*, or a local aberration—for it is only known on Talaut—it will be desirable to have a name for it".

Oberholser (1919) treated both large and small forms as *Halcyon chloris enigma*, concluding that an unusual variation in size occurs, although he examined only one specimen of *enigma*. Such a large size dimorphism within a population of birds is unknown (Eck 1978), and Oberholser's conclusion can be discounted.

Eck (1978) reviewed the taxonomic position of the two forms, having for examination 12 small specimens from Karakelang and 21 large specimens from Karakelang, Salibabu and Kabaruan. The small birds were shown to be close to *H. c. chloris* of Sulawesi in colouration, whilst the larger birds were closer to *H. c. collaris* of the Philippines or *H. c. teraoki* of Palau. Measurements were taken from the specimens and it was shown that an uninterrupted series can be made from skins. Eck therefore concluded that the two forms on Talaud were conspecific; *enigma* represented a small form of *chloris* on Talaud, whilst larger birds were named *Halcyon chloris* ssp.

Greenway (1978) suggested that large birds could be migrants from Sulawesi that had lingered on Talaud, but the seasonal movements of Sulawesi and Philippine birds need further investigation (White & Bruce 1986).

Other reviews noted that if both forms were shown to breed on the islands and behavioural differences are observed, *enigma* would represent a separate species (Fry 1980, Eck 1978). Bruce visited Salibabu in 1978 and "found apparent ecological separation, with one form in the forested areas (presumably *enigma*) and others in more characteristic coastal habitat" (White & Bruce 1986).

Recent authorities (Andrew 1992, Sibley & Monroe 1990) list *enigma* as a separate species. In recent years researchers have failed to record the species on Karakelang (Taylor 1991, Bishop 1992, D. A. Holmes *in litt.*), although Rozendaal collected 6 specimens in the period 12–25 February 1985 (R. W. R. J. Dekker *in litt.*).

In 1995 and 1997 *chloris*-type birds were observed on both Salibabu and Karakelang, and our fieldwork supported the suggestion that the small form on Talaud should be regarded as a separate species, *Halcyon enigma* and the larger form as *Halcyon chloris*. This conclusion is based on new information gathered in four areas and a review of the published data. In the discussion that follows, small birds are named *enigma* and large birds *chloris*.

Field characters

The two forms were easily identifiable in the field by the differences in colouration and size noted by Eck (1978). The following description is based on features noted in the field.

Enigma. Eye dark; legs dark; bill - upper mandible black, lower mandible basal half horn, distal half black. Clean white underparts, slightly washed with buff on the throat. The white extends round the neck to form a broad, well marked collar, bordered above by black, the black not extending onto ear-coverts. Small white spot on the nape. Crown, forehead, ear-coverts and upper nape are uniform deep bottle-green with a blue tinge. Loral patch is white and extends to reach the eye. Back and mantle are dirty olive green, contrasting with the green–blue of the wings. The wings are darkest on flight feathers; scapulars same colour as back and mantle; coverts light blue and slightly iridescent. Rump electric blue, lighter than iridescent blue tail.

Chloris. In contrast has a black band extending from the eye to the black collar. The upperparts and wings of *chloris* are a uniform blue without green hints, and *chloris* has only a small white loral patch, which never reaches the eye.

In the field *enigma* is most easily separated by its shorter bill that appears less heavy, partly because the lower mandible is less protruding and more extensively coloured horn from the base. *Enigma* also has a noticeably shorter tail compared to *chloris*. *Enigma* characteristically adopts a slightly hunched posture when perched, leading to a dumpy appearance.

Ecological separation

As suggested by White & Bruce (1986), the two forms were found to show clear ecological separation. *Enigma* was found only in forest or forest edge habitats, and is commonest in undisturbed forest on Karakelang. It was also commonly encountered in degraded or

secondary forest, and so seems able to withstand some habitat alteration, although in cultivated areas it is apparently out-competed by *chloris*.

Enigma was most commonly observed in the mid-canopy, between 6 and 15 m above ground, and was not seen in the sub-canopy, being replaced in this zone by the Ruddy Kingfisher *Halcyon coromanda*. At rest birds habitually perched in the mid-canopy layer, but were observed in the crowns of trees of heights up to 20 m. Birds were seen feeding along rivers and streams, as well as within forest, utilising a suitable vantage point to scan the ground below, before diving down onto prey. Prey items appeared to include small grasshoppers and river snails.

Chloris was noted on Salibabu and Karakelang in coastal habitats typical of the species, including mangroves, cultivated areas, such as coconut plantations and low-lying secondary scrub habitats. The species was commonly observed in these areas and was even found in towns, perching on electricity cables.

Sympatric breeding

It has been suggested that *chloris* are migrants to Talaud from Sulawesi or the Philippines and *enigma* are resident breeders on the islands (Eck 1978, Greenway 1978). As noted by Fry (1980), if both forms are shown to be resident and breeding on Talaud, *enigma* must be accorded specific status.

There are now dated specimens and field observations of *enigma* between January and November and of *chloris* between January and November; the absence of records for either form in December simply reflects the fact that no ornithologists have visited Talaud in this month. If emigration were taking place, some seasonal variation in relative encounter rates would be expected; in 1995 and 1997 *enigma* and *chloris* were observed at similar frequencies in both years. Hence it may be concluded that both *enigma* and *chloris* are resident on the islands.

Previous observations of *chloris* indicate that its breeding season is August–October in Sulawesi (White & Bruce 1986) and April–June in the Philippines (Dickinson *et al.* 1991). All published sightings of *chloris* on Talaud therefore fall within the known breeding seasons of adjacent populations, suggesting that the population is resident on Talaud and breeds. Evidence of a breeding population of *chloris* on Karakelang was provided when a single juvenile bird was observed near the village of Bengel (4°14′N, 126°49′E) on 23 September 1995. The bird had been captured by local children, who reported it had recently fledged from a site near the village. The bird was identified tentatively as *chloris* on size, in particular the large bill which, although not measured, even in a young bird appeared proportionately too large for *enigma*, and as a juvenile by a faint buff wash to the underparts and brown–buff freckling on collar and breast. The September date falls within the range given by White & Bruce (1986) for breeding on Sulawesi. In late March 1997, on a tiny offshore islet near Dapalan, Karakelang (4°24′N, 126°55′E), a pair of *chloris* were seen displaying,